PM STRAUSS & ASSOCIATES
Energy and Environmental Consulting Services

November 10, 2006

Thomas Macchiarella
BRAC Program Management Office
1455 Frazee Road, Ste. 900
San Diego, CA 92108
Attn: BPMOW.TLM

Subject: The Proposed Plan for Site 1

Dear Thomas:

It is clear that a lot of work has gone into the Proposed Plan. However, based on my analysis, I do not believe it will assure protection to the public, the future landowners and the environment. I do believe that there are elements of the Proposed Plan that are important to begin. Therefore, my overarching recommendation is that this Plan become an interim Plan until certain information is developed.

From years of environmental experience with cleanup, significant uncertainty about attaining deadlines and Remedial Action Objectives (RAOs) require adopting a flexible, adaptive approach for cleanup. There are always going to be some unknowns in a cleanup, but these should be limited to the extent possible. The Proposed Plan will lead to the Record of Decision, which is the key legal framework for cleanup of the site. The ROD is essentially the strategic Plan for achieving the RAOs. That being stated, the Navy is placing too much emphasis on resolving issues in the remedial design phase, where public stakeholders have little or no say.

Elements of the Plan that should begin without further investigation or delay include removal of the pistol range berm and removal of radioactively contaminated wastes in areas 3, 5, 1b, and the site of the radium disposal trench. However, if groundwater is encountered at Area 1b, it is my recommendation that work should be halted until one of the important data gaps is resolved; that is, an evaluation of dioxins and furans in groundwater in the former burn area. If results are positive, this should be followed by a determination of an appropriate treatment system for removing this contaminant from the dewatering activities. When this is completed, then full excavation of the burn area should proceed.

Following are my major conclusions and recommendations, based on my review of documents. A more detailed exposition of these conclusions and recommendations can be found in the Comments on the Proposed Plan.

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1. Other potential groundwater constituents, as identified in data gaps in the Feasibility Study should be evaluated prior to a final ROD.
2. Geophysical surveys to determine the extent of waste in the landfill and proximity to San Francisco Bay should be evaluated prior to a final ROD.
3. The entire issue of seismic stability should be revisited prior to a final ROD. Resolution of this involves the remedy selection and is not appropriate to be left to the design phase.
4. A wetland mitigation ratio of 2:1 should be the minimum ratio allowed.
5. The scope of Site 1 should include sediments that are immediately adjacent to the landfill, for these potentially contain contaminants from past migration from the landfill. Offshore sediments are currently being addressed by the regional sediment work group and were not addressed in the Site 1 FS Report.
6. The groundwater plume to be treated needs a complete characterization before a final remedy is selected. Recent experience with the proposed remedy has indicated that the magnitude and location of contaminants are critical for successful implementation.
7. There is concern that the remedy may lead to the release of other contaminants, including radium and metals. The Plan should include a capture and monitoring system to be used when the groundwater is undergoing treatment so that excess oxidants and potentially released contaminants are not released beyond the treatment area. A network of "Guard wells" (i.e., extraction wells at the downstream boundary of the treatment zone) and "Sentinel Wells" (monitoring wells to ensure that the guard wells are capturing released contaminants) should be developed and included in the Plan.
8. I think that the Navy should not rely on Monitored Natural Attenuation (MNA) for a major role in the groundwater remedy, especially since there are DNAPLs in the groundwater plume. Although the FS indicates that there is breakdown of TCE into Dichloroethene (DCE) and vinyl chloride, the attenuation process often stalls at this point, with a buildup of vinyl chloride, which is probably more toxic than TCE. Realizing that the proposed remedy removes some of the source through ISCO, I believe that the Navy must have an objective that at least 75 percent of the reduction takes place through biological or chemical destruction, not through dispersal and diffusion.
9. I recommend that along with ISCO, enhanced in-situ biological remediation be retained, especially if monitoring downstream indicates that there are still high levels of vinyl chloride.
10. There has not been a sufficient survey to identify special-status species. Habitat exists for a number of special status and rare and endangered species. There are rare and endangered and species of special status at Alameda Point, including but not limited to the Least Tern, the Alameda Song Sparrow, and possibly wetland and marsh species such as the Salt marsh harvest mouse and the Salt marsh

wandering shrew, the Great Blue Heron, and the Clapper Rail. These species are often risk drivers at wetland and marsh sites.

11. Little attention is paid in the documents about how radionuclides and other chemicals can be mobilized by changing environmental conditions. If waste is left in place, in what is an unlined pit, it is incumbent upon the Navy to further investigate factors that would mobilize contaminants and determine a mechanism for monitoring environmental change.
12. Under the Navy's recommended alternative for soil in Area 1a, radium would be left in place. I recommend that the Navy establish a low threshold level for wastes that are left.
13. I recommend that the Navy adopt a cleanup level for human health risk that is equivalent to a one-in-one million excess cancer risks.
14. The risk assessment should include the latest information, including the 2006 finding by the National Academy of Sciences (NAS) that EPA's 2001 draft health risk assessment for TCE was valid.
15. It is my opinion that if waste is going to remain in place, an engineered cap that limits water infiltration is necessary.
16. The cap design should include a bio-barrier to prevent burrowing animals.
17. It is unclear whether the Navy has considered the re-use plan for golf course in its remedial design. The golf course would impose additional structural parameters in the case of a seismic event, and would require a great deal of irrigation water that would infiltrate the cap. Both of these elements need to be looked at in the cap /cover design.
18. It is worth considering that climate change is expected to cause sea levels to rise by approximately 3 feet over the next 100 years. All proposed remedies that are adjacent to the Bay should take this into consideration.
19. I agree that State Water Resource Control Board Resolution (SWRCB) 68-16 (i.e., the non-degradation policy) and SWRCB Resolution 92-49 apply to groundwater at this site.
20. It is crucial that the Plan state who will be responsible for maintaining the stability and performance of the cap once a golf course is put in place.
21. This is the most confusing Proposed Plan that I have read, and I think it would be helpful for all concerned that a better explanation of the Site 1 proposed remedy be rewritten.

Yours very truly,

Peter M. Strauss

Comments on the Proposed Plan for Site 1

On Behalf of the Alameda Point Restoration Advisory Board

Peter Strauss

PM Strauss & Associates

November 6, 2006

COMMENTS

Data Gaps

1. The resolution of many data gaps is not addressed in the proposed plan; instead, they are planned for the remedial design stage. In 2004, the Environmental Protection Agency (EPA) Remedial Project Manager (RPM) expressed frustration with the lack of data used in the Remedial Investigation/Feasibility Study (RI/FS). He expressed concern that that the lack of information could compromise the ability of stakeholders to select a final alternative. If an alternative was selected that relied on extensive data collection during remedial design to verify assumptions, he cautioned that time-consuming Record of Decision (ROD) amendments could potentially be required. It is my opinion that each of the data gaps should be resolved before a final plan is completed. These include:
    - **Delineation of Trichloroethene (TCE) in groundwater at the north end of Site 1, adjacent to the inner harbor.** The lateral extent of TCE in this area has not been defined. The FS reported that this will be investigated as part of the remedial design phase; however, it may be investigated sooner. At this time, we don't know if this analysis was completed and whether there will be additional groundwater remediation required.
    - **Analysis for 1,4-dioxane in groundwater using lower detection limit.** 1,4-dioxane is a solvent stabilizer that was added to Trichloroethane (TCA) and other solvents. The groundwater analysis used a high detection limit so that this contaminant was not fully characterized. Information about the presence of 1,4-dioxane in groundwater in the plume area will be available during the remedial design phase of the project. Yet, it is not clear whether the In-Situ Chemical Oxidation (ISCO) process fully works on this chemical.
    - **Analysis of groundwater in the burn area for dioxins/furans.** At the latest, groundwater samples will be collected during the remedial design phase from the monitoring wells in the burn area and analyzed for dioxins and furans. The presence of dioxins and furans will be an important consideration on how this area is remediated.
    - **Analysis for explosive constituents in groundwater.** Analysis of groundwater samples for constituents indicative of ordnance in first water-bearing zone (FWBZ) groundwater will be conducted during the remedial design phase of the project. Again, a treatment system for constituents indicative of explosives may require different treatment than ISCO.
    - **Radiological survey of the riprap slope areas.** Information about the presence of radium-impacted waste in the shoreline areas will be available during the remedial design phase of the project. This is a major concern for human and ecological health and may affect the scope of the remedy, and lead to further investigation whether radium has made its way into the Bay.
    - **Assessment of residual impacts in the waste disposal area.** Installation of four interior and/or perimeter wells has been included in all the active groundwater remedial alternatives. Groundwater data from these wells will be available during the remedial design phase of the project and will be used to evaluate groundwater quality in the waste disposal area and assess whether drummed liquids were disposed of at Site 1. One of the concerns is that there are drummed wastes in the landfill, which may require spot excavation. Covering it with a cap before this is known is premature.

known is premature.

- **Ecological risk assessment (ERA) for unpaved areas of Site 1 outside the disposal area.** An ERA of the unpaved interior areas of Site 1 will be performed as part of the remedial alternatives for soil in Area 3. The ERA will be conducted during the remedial design stage of the project and the results of the ERA will be used to determine the extent of the hot spot removals in Area 3.
- **Wetlands evaluation.** An evaluation of the functionality and extent of wetlands in Areas 1 and 3 will be conducted during the remedial design stage for mitigation planning purposes. The final mitigation ratio and amount of mitigation will also be determined at that time based on the location and type of wetlands. Again, this determination should be part of the proposed plan and vetted before the public.
- **Geophysical surveys.** Geophysical surveys would be conducted to assess the limits of buried waste and the proximity of waste to the San Francisco Bay under preferred alternatives S1-4 and S5-4. This clearly is a characterization activity, and proposals or areas affected require this information prior to remedy selection. Additionally, depending on the results of the buried waste delineation activities, the recommended geotechnical remedy (3,000-foot-long soil cement gravity wall and stone columns) may not be the most feasible and cost-effective geotechnical remedy for Site 1.

Scope

2. The proposed plan covers Site 1 but not the contamination that potentially has emanated from Site 1 into the Bay and the inner harbor. The FS and responses to comments on the FS all point out that the waste has been sitting in groundwater for some time, and much of it has probably been sorbed or has washed into the bay. During the mid-1990s, sediment samples were taken and at that time, the Navy determined that results were expected for ambient concentrations in the San Francisco Bay and unlikely to pose an increased health or ecological risk relative to the rest of the bay. Offshore sediments are currently being addressed by the regional sediment work group and are therefore not addressed in the Site 1 FS Report. Due to advances in the science of ecological risk and estimates of "ambient levels", this statement is no longer valid. The low tidal areas adjacent to Site 1 should be included in the scope of this plan, or an amendment to the plan.

Groundwater

3. In-situ Chemical Oxidation (ISCO) works if the oxidizing agent comes into contact with the contaminant. Whether or not ISCO will work at the particular site depends on the soil/geology of that location, the source area characteristics and how well the VOC plume is characterized. Yet, the characterization of the VOC plume is incomplete, as shown on Figure 4 of the Proposed Plan. A recent experience with ISCO in Rhode Island has proven ineffective, probably because the magnitude of contamination was not yet fully understood.

4. The common oxidants are hydrogen peroxide-based Fenton's Reagent, and potassium manganate ($KMnO_4$), better known as permanganate. Fenton's Reagent is produced on site by adding an iron catalyst to a hydrogen peroxide solution, and works best with a pH adjustment. The Regional Water Quality Control Board (RWQCB) RPM expressed concern that ISCO may cause the release of other

contaminants now stabilized in the landfill (metals). The most common oxidant delivery method involves the injection of oxidants, and the targeted delivery of oxidants to the contaminant zones may require both injection and extraction wells. The Proposed plan must make clear that it will capture the oxidants if there is a release of other contaminants. This will also require frequent sampling downstream after initial injection.

5. In a related point, the selection of the oxidizing agent should preclude activation or release of other contaminants (such as Radium-226) that may be trapped in the saturated and vadose zones. The Proposed Plan should indicate if this is a potential problem, and what would be done to mitigate it. Since the Radiological investigation only characterized surface anomalies, it is not certain whether parts of the area that are scheduled for ISCO would have radionuclides below the two foot depth.

6. The plan should include a capture and monitoring system to be used when the groundwater is undergoing treatment so that excess oxidants and potentially released contaminants are not released beyond the treatment area. A network of "Guard wells" (i.e., extraction wells at the downstream boundary of the treatment zone) and "Sentinel Wells" (monitoring wells to ensure that the guard wells are capturing released contaminants) should be developed and included in the plan.

7. I was struck by the somewhat lenient groundwater cleanup goals. The remediation goal for vinyl chloride, a known carcinogen, is three orders of magnitude greater than the drinking water standard; TCE is an order of magnitude higher than the drinking water standard. Although it is acknowledged by the regulators that the groundwater is a not potential drinking water source, these high contaminant levels are of concern as they make their way to the bay. It is important to note that a dispute exists between the RWQCB and the Navy over whether it must comply with California's non-degradation policy (SWRB 68-16 and 92-49), which has as one of its objectives limiting polluted waters from contaminating less polluted waters. Additionally, as the groundwater is shallow and flows just under the "sandy beach", vapors from the underlying shallow groundwater may be released. In particular, vinyl chloride vapors should be assessed using the most recent scientific information.

8. I think it is important that the Navy does not rely on Monitored Natural Attenuation (MNA) for a major role in the groundwater remedy. Public stakeholders at many sites view "natural attenuation" with skepticism and some view it as a do nothing approach. Although the FS indicates that there is breakdown of TCE into Dichloroethene (DCE) and vinyl chloride, the attenuation process often stalls at this point, with a buildup of vinyl chloride, which is probably more toxic than TCE. Realizing that the proposed remedy removes some of the source through ISCO, I believe that the Navy must have an objective that at least 75 percent of the reduction takes place through biological or chemical destruction, not through dispersal and diffusion. This may be achievable, as the FS points out that ISCO at the Naval Weapons Station Seal Beach reduced VOCs by 80%.

9. The high level of DCE in groundwater (3,900 ppb) and vinyl chloride (9,400 ppb) west of the former engine parts storage and cleaning area is probably the result of natural breakdown of TCE. It supports the conclusion that some attenuation is occurring; however, vinyl chloride is more persistent, more mobile, and more toxic than its parent products (e.g., TCE). This "line of evidence" to demonstrate that natural attenuation is occurring is not sufficient by itself to persuade agencies that that MNA will continue to work as a remedy. EPA puts the burden of proof on the party that proposes natural attenuation as a cleanup remedy, and requires "multiple "lines of evidence". While natural attenuation in general has both advantages and disadvantages, the proponent must present convincing site-specific technical evidence that natural attenuation will effectively protect human health and the environment and, furthermore, that it will achieve remedial objectives within a reasonable time frame. Project proponents must demonstrate that human or environmental receptors will not be exposed to greater risks during the long natural attenuation process.

10. There is continued concern that ISCO is not effective at treating a large mass of volatile organic compounds (VOCs), such as is found in dense non-aqueous phase liquids (DNAPLs). Rebound, or the rise in contaminant levels after it was seemingly reduced, may be high if an appreciable DNAPL mass remains in the source zone and soil/groundwater. However, based on the literature, Fenton's Reagent is somewhat effective if it comes into contact with the DNAPL.

11. TCE, a common contaminant found in groundwater, is sold under about fifty different trade names. Some of these products contain additives used as stabilizers, which make up two to eight percent of the total weight. These stabilizers are numerous and they have not been considered when developing strategies for natural attenuation. For example, the most common stabilizer, 1,4-dioxane in TCA, does not readily attenuate, and is only going to be looked at in the remedial design phase. The matter of stabilizers, particularly 1,4-dioxane, should be analyzed as soon as possible, as it may lead to a different remedial strategy for groundwater.

12. I recommend that along with ISCO, enhanced in-situ biological remediation be retained, especially if monitoring downstream indicates that there are still high levels of vinyl chloride.

Soil

13. Some of the soil remediation goals seem high. I anticipate that most of the remediation goals will be determined by ecological assessment, with some of the goals being determined for the seasonal wetlands. Realizing that the ecological assessment is species and habitat specific, I encourage the Navy to consult with all parties about species of concern. It should also be noted that the EPA, the RWQCB and the Navy agreed to cleanup goals at Moffett after considerable debate and community input. Below I have compared the Alameda Point soil remediation goals to sediment goals at Moffett Field, in the South Bay. I am particularly struck by the difference in goals for DDT in soil at Alameda Point and those at Moffett.

Comparison of Alameda Point Soil Cleanup Goals and Moffett Sediment Cleanup Goals

	Alameda Pt.	Moffett – Salt Marsh		Moffett – Open Water	
Contaminant		Low TRV	High TRV	Low TRV	High TRV
PCB µg/kg	380	59	210	97	1,179
DDT µg/kg	1,200	0.51	109	0.51	109
Lead mg/kg	56	0.01	93	0.38	151
Zinc mg/kg	300	6.5	314	66	664

µg/kg micrograms per kilogram
mg/kg milligrams per kilogram
TRV threshold reference value

Ecological Risk

14. There has not been a survey to identify special-status species. Brown pelicans have been seen flying to the beach area, and habitat exists for a number of special status and rare and endangered species.

15. Given that we know that there are rare and endangered and species of special status at Alameda Point, including but not limited to the Least Tern, the Alameda Song Sparrow, and possibly wetland and marsh species such as the Salt marsh harvest mouse and the Salt marsh wandering shrew, as well as species of special status, including the Great Blue Heron, and the Clapper Rail, these species should be considered in risk calculations. Below I have included a Table for cleanup goals for those species at Moffett Field, under a salt marsh scenario.

		Lead mg/kg	Zinc mg/kg	DDT µg/kg	PCB µg/kg
Alameda Song Sparrow	TRVhigh	**93.8**	518	251	881
	TRVlow	0.24	51.8	1.17	72.7
Clapper Rail	TRVhigh	202	886	356	1,574
	TRVlow	0.51	88.6	1.66	130
Great Blue	TRVhigh	209	803	**109**	2,856
	TRVlow	0.53	80.3	**0.51**	236
Salt Marsh Wandering Shrew	TRVhigh	1,416	**314**	513	**210**
	TRVlow	**0.01**	**6.5**	25.6	**59**

Note: Numbers in **bold** are risk drivers

16. It is important to note that polychlorinated biphenyls (PCBs), lead and cadmium were found in soils that are part of the seasonal wetlands. The seasonal wetlands provide rest, shelter, and forage for Canada geese and other migratory water fowl, as well as for raptors. Some of the marsh species may occupy those sites during part of the year. Identification of those species is a necessary step before soil cleanup goals should be adopted for soils within the seasonal wetlands. Special status species and some marsh species should be included in any revised ERA.

17. VOCs and benzene are groundwater contaminants that underlie SW1 (i.e., seasonal wetland 1). It is important that any overlap of the wetlands and these plumes are fully characterized for eco-risk, including sediment and vapor transport.

18. Some of the wetlands will be affected or destroyed by the remedies, requiring the Navy to mitigate the wetlands. Most often this is done on at least a 2:1 ratio because creating a new wetland is difficult and often fails. The Navy has failed to commit to a mitigation ratio, and I recommend that it do so in the proposed plan.

Radiological Characterization and Cleanup

19. Albeit that radiological characterization is difficult and only detected near-surface anomalies, it is important to point out that little attention is paid in the documents about to how radionuclides (radium, strontium$_{90,}$ and perhaps medical wastes that were disposed of from Oak Knoll Naval Hospital) can be mobilized by changing environmental conditions, as is pointed out in the concern about using an acidic oxidizer like Fenton's Reagent. Because this landfill is an unlined pit, it is incumbent upon the Navy to further investigate factors that would mobilize contaminants and determine a mechanism for monitoring environmental change and ensuring that radionuclides will not be transported in the future.

20. As is noted in the Final Radiological Characterization Report "[O]ther naval installations, including Oak Knoll Naval Hospital, Naval Supply Center Oakland, and Treasure Island, also used the site for waste disposal." It is not clear whether any of these facilities also may have disposed of low level radioactive waste at Site 1, but a full record of what other wastes have been disposed of at Alameda Point should be fully investigated. There has been extensive information generated about disposal activities of radioactive waste at three other Bay Area Naval facilities (Hunter's Point, Treasure Island and Mare Island). For example, records were declassified in 2001 for the Naval Radiological Defense Laboratory, which was located at Hunter's Point Naval Shipyard. It is not clear from the background information in the RI/FS whether this information was reviewed to determine other sources of radioactive materials at Site 1.

21. All radium-impacted waste in Areas 1b, 3 and 5 exceeding 4,000 counts per minute (cpm) above background would be removed, as described for Alternative S6-4. Area 1b and wastes that are near a suspected former radiological disposal trench contain all radium-impacted waste exceeding 200,000 cpm that would be removed. The remainder of radium in Area 1a would be left in place. There appears that there is no threshold value given for radium contaminated wastes that are going to be left in Area 1a. I recommend that the Navy establish a threshold level for wastes which will remain on site.

22. The Navy needs to establish a protocol for removal of radioactive substances and confirmation sampling. Specifically, when radioactive substances are encountered, it will be important to know how much waste and surrounding soil will be removed. For example, if a radioactive dial is encountered, how much soil around and beneath the dial will be removed? Also, please identify what type of confirmation/verification sampling will be conducted to ensure that soil left in

place is clean. It is recommended that as the Navy begins excavation of any radioactive material, it confirm that the area is clean using the high-purity germanium detector (HPGe), along with confirmation samples that are sent to the laboratory for gamma spectroscopy.

23. The field survey of radiological waste was done with using a sodium-iodide (NaI) detector, and confirmed with an HPGe detector. Both detect gamma rays. HPGe detectors are "favored when definitive spectroscopic measurements are needed." (Technology Overview: Real Time Measurement of Radionuclides in Soil: Technology and Case Studies, Interstate Technology and Regulatory Council, February, 2006). Citing recent experience at the Fernald uranium processing facility in Ohio, the Department of Energy (DOE) recommended using the HPGe detector for Radium-226, which is a weak gamma emitter (i.e., alpha and beta are not picked up by either detector). An example of the different sensitivity (i.e., detection limits) of the two detectors is shown in the Table below.

COC	Fernald Action Limit (pCi/g)	Minimum Detectable Concentration (pCi/g)	
		HPGe	NaI
Uranium	55	1.9	78
Ra-226	1.5	0.075	1.1

pCi/g Pico Curies per gram

Burn Area

24. For Area 1b, excavation activities are assumed to extend into groundwater, requiring a dewatering and sediment filtration system. Extracted groundwater is assumed to require treatment for removal of dissolved heavy metals and VOCs. A temporary treatment system would be brought on-site and operated with an ion exchange for metals removal and granular activated carbon (GAC) for VOC removal. The system is assumed to operate at 100 gallons per minute during excavation, and to discharge to the San Francisco Bay. Dewatering would require planning, treatment system oversight, and a sampling program for the duration of the dewatering program. Note that dioxins/furans are still being investigated; yet it is not clear whether GAC would be appropriate to remove these contaminants from the waste stream. This element of the remedy should be discussed in the proposed plan. More importantly, it suggests that almost all groundwater underlying Area 1 is contaminated with heavy metals and VOCs. Again, I can only conclude that contaminated groundwater and leachate are making their way to the Bay.

Human Risk

25. The National Contingency Plan [Section 300.430 (e)(2)(A)(2)]states that "For known or suspected carcinogens, acceptable exposure levels are generally concentration levels that represent an excess upper bound lifetime cancer risk to an individual of between 10^{-4} and 10^{-6} using information on the relationship

between dose and response. The 10^{-6} risk level shall be used as the point of departure for determining remediation goals for alternatives when ARARs are not available or are not sufficiently protective because of the presence of multiple contaminants at a site or multiple pathways of exposure;". I recommend that the Navy adopt the "point of departure' as its remedial goal.

26. The risk assessment should include the latest information, including the 2006 finding by the National Academy of Sciences (NAS) that EPA's 2001 draft health risk assessment for TCE and the Science Advisory Board's review of the draft TCE Health Risk Assessment (http://www.epa.gov/sab/pdf/ehc03002.pdf.). As such, I expect that allowable groundwater contamination standards and health risks for TCE in the air will change and be stricter in the future. TCE was only the first of many substances to be reviewed. I expect that the allowable standards for its daughter products (DCE and vinyl chloride) will also be reviewed and possibly changed. Although the effectiveness of remedies is evaluated in a Five Year Review, which includes changes in standards, it is important that the proposed remedy for groundwater take this new information into consideration. Most importantly, the question remains as to whether the proposed remedy can achieve those new standards.

    In August 2001, U.S. EPA's Office of Research and Development (ORD) released the draft Trichloroethylene Health Risk Assessment: Synthesis and Characterization (TCE Health Risk Assessment) for external peer review. The draft TCE Health Risk Assessment took into account recent scientific studies of the health risks posed by TCE. According to the draft TCE Health Risk Assessment, for those who have increased susceptibility and/or higher background exposures, TCE could pose a higher risk than previously considered. Standards for cleanup are expected to be even stricter than the preliminary remediation goal (PRG) for TCE (2.3 ppb). The Science Advisory Board, a team of outside experts convened by U.S. EPA, reviewed the draft TCE Health Risk Assessment in 2002, and concurred with the results. In 2003, Region IX promulgated a "provisional" PRG for air that was an order of 65 times stricter than had been applied prior to 2003. Both the Department of Defense and Department of Energy strongly objected and EPA backed off enforcement of the provisional PRG until NAS external review. This review was completed this year and concurred with the EPA Health Risk Assessment.

    Additionally, California has a Public Health Goal (PHG) that should become a "To-Be-Considered" Applicable or Relevant and Appropriate Requirement (ARAR). For TCE in groundwater, the PHG was changed from 2.3 ppb to 0.8 ppb. This is assumed to be equivalent to an increased risk of 1 in a million excess lifetime cancers. This latter number was adopted by the Office of Environmental Health Hazard Assessment, and is in conformance with the State Implementation Plan.

Cap Design and Remediation of Area 1

27. It is my opinion that if waste is going to remain in place, then an engineered cap that limits water infiltration is necessary. It is not clear why the engineered cap

has been rejected; or even why a soil only cap would meet regulatory requirements. There is not sufficient evidence to rule out that groundwater will continue to act as a transport mechanism for dissolved contaminants to the Bay. At Moffett, the Runway landfill was also first proposed as a soil cap; the RAB at Moffett and regulators requested that an engineered cap be constructed. The Navy has argued in its response to EPA comments on the FS that since the landfill stopped operating before cover requirements went into effect, it does have to meet some closure requirements (e.g., Section 22 CCR 66264.310(a)(1) requires a cover designed to prevent the downward entry of water into the landfill for 100 years). Whether this statement is correct does not relieve the Navy of choosing a remedy that controls contaminant migration.

28. An alternative not considered in the engineered cap is using a bentonite layer to impede infiltration. This may be less expensive than a geomembrane, and has the benefit of a certain amount of self repair in case of a seismic event.

29. The cap design should include a bio-barrier that prevents burrowing animals from coming into contact with the waste.

30. An engineered cap covering part of Area 1 was not considered, but may be possible for Site 1. The runway in Area 1a may not have to be covered, so long as there is pavement inspection and maintenance program, as suggested by Remedial Alternative S2-4. Note, however, that surface inspection of the runways, or for that matter the proposed soil cap or engineered cap, would not be possible once a golf course is built.

31. The reuse plan has designated the Site 1 area for recreational reuse consisting primarily of a golf course, a beach area, and a shoreline walking path. Additionally, a historic training wall is present along portions of the northern border of Site 1. It is unclear whether the Navy has considered the Golf course in its remedial design. The golf course would impose additional structural parameters in the case of a seismic event, and would require a great deal of irrigation water that would infiltrate the cap. Both of these elements need to be looked at in the cap /cover design.

32. The Soil Cap alternative proposes to use dredge materials from Oakland Harbor. This may not be clean soil, and would require additional study to ensure that there are not additional contaminants being added to the cover. I recommend that if the Navy is going to use dredge spoils for a soil cap, then a rigorous sampling program should be adopted to ensure that contaminants such as lead, PCBs, MTBE and PAHs are screened prior to emplacement.

33. In August 2002, the Geotechnical Feasibility Report "recommended" that a 24-ft wide soil-cement gravity wall with stone columns placed adjacent to and in the fill to reduce the effects of liquefaction and preventing slippage into the San Francisco Bay. However, this element was not included in the proposed remedy and was left for further study in the remedial design stage. By not including this design component, and its costs, into the analysis of alternatives, the exclusion of remedies such as excavation of larger areas is a biased result.

34. In addition, the FS stated that shoreline debris relocation component for one of the alternatives was intended to provide an alternative to a soil-concrete gravity wall that was recommended in the Geotechnical and Seismic FS for Site 1 (2003). This was based on the assumption that excavating buried waste within 25 feet of the shoreline and relocating the excavated waste to the interior of Site 1 may reduce the risk of a waste release to the San Francisco Bay from earthquake-induced lateral spreading. This alternative was not adopted in the proposed plan; however, the FS states that depending on the limits of buried waste and shoreline waste relocation activities, the Navy could reduce the scope of (or eliminate the need for) a geotechnical remedy. This statement goes to the very heart of the criticism of the proposed plan: that is, by not characterizing the waste cells, the proposed remedy is uncertain both in terms of cost and effectiveness.

35. Another element of the proposed plan that should be evaluated for Area 1 is removal of hot spots within Area 1, besides removal of Area 1b. Many comments on the FS were concerned that covering the waste would leave small, time-delayed pockets of material that may contaminate the groundwater and the Bay in the future. Because the Navy has not even determined whether drummed wastes still exist in the landfill or the extent of wastes in the landfill (see Data Gaps), I think it is important that hot spot removal not be precluded from the remedial options. Only after full characterization can the Navy realistically cover the remaining waste.

36. The FS states that the Navy may further evaluate other alternatives to the stone columns during remedial design. Recent experience has shown that considerable cost savings can be achieved with "earthquake drains" offered by Nilex, successfully installed in fill soil used for the approach to the new San Francisco-Oakland Bay Bridge and have undergone a rigorous review and acceptance process by the California Department of Transportation. The entire discussion of seismic stabilization should be revisited, prior to the adoption of the Record of Decision.

37. It is worth considering that most scientists agree that climate change will cause sea levels to rise over the next 100 years. Predictions of a 3 foot rise in sea levels over the next 50-100 years are generally accepted. A sea level rise of 6 inches will change the frequency of a 100 year storm surge to a 10 year storm surge at the entrance to the Bay. All proposed remedies that are adjacent to the Bay should take these facts into consideration. It is worth noting that most of the remedies which leave waste in place are given a rating of moderate for long term effectiveness and permanence. However, in the discussion of this criterion in the FS, there is not a discussion of climate change.

Applicable or Relevant and Appropriate Requirements (ARARs)

38. I agree that State Water Resource Control Board Resolution (SWRCB) 68-16 (i.e., the non-degradation policy) and SWRCB Resolution 92-49 apply to groundwater at this site. This resolution applies to discharges: either underground or above ground discharges as is commonly understood by the general term discharge. I encourage the RWQCB to ensure compliance with these Resolutions.

Range Cleanup

39. The firing range berm had a foundation of concrete mixed with 55-gallon drums of 20 mm projectiles. It is not clear whether the proposed plan and TCRA includes removal of the foundation, or whether there has been an analysis of whether any of the elements, including lead, have migrated from the concrete. If soil below the berm is also to be screened, soil contaminated with both metals and organic compounds may make this solution difficult. If soil contains volatile organic compounds (VOCs), it would be akin to aerating the soil and may require additional regulatory oversight. Measures should be taken to prevent wind-borne particulates that may be laden with lead if dry screening is a step in the process.

40. The skeet range, next to the pistol range, generated lead shot and fragments of clay pigeons. These clay pigeon fragments contained PAHs. Some clay pigeon fragments are still evident on the surface within the line of fire. The zone of fire in the bay was designated as Site 29, and is not a subject of this Proposed Plan. However, ranges such as this have a great deal of scatter, and some lead shot is potentially beyond the Site 29 boundary, very near to the shoreline. At low tides, shorebirds feed in this area, and the lead shot in particular poses a threat. The Navy should take note that EPA's guidance document on Best Management Practices at Outdoor Shooting Ranges (EPA Region 2, 2001) strongly states that "Shooting into water bodies or wetlands should not occur". Most current best practice manuals, even those developed by sport shooting organizations, do not advocate shooting into water or wetlands.

41. Has depleted uranium (DU) been used in any of the shells? Does the Navy need to list a cleanup standard for DU?

Institutional Controls

42. The Institutional Controls, as set forth in the Proposed Plan, have two difficulties, related to the eventual conversion of Site 1 into a golf course and public beach. Proposed land-use restrictions, although specified, fail to state how they will be enforced, and who will enforce them. For example, the City has proposed building a golf course over the landfill cap essentially adding approximately 8-feet of additional soil. Aside from destroying the cap vegetation cover, the added weight and irrigation regime may cause additional infiltration, increase leachate and reduce stability. It is crucial that the Plan state who would be responsible for maintaining the stability and performance of the cap.